Prime Number – Prime factorization in different ways

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Abstract

In order to judge the prime number, many division operation is done. Those who read this document will be able to subtract by addition and subtraction without multiplication and division operations. A prime number is one with no proper factors. It would take a few hundred digits to determine which number is a prime number, and it would take a while to divide it into computer operations. It is almost impossible to determine whether tens of millions of digits are a minority. If the number of judgments is increased by dividing the decimal judgments, the processing time is increased sharply and the time can not be processed. However, the time of judgment is reduced by treating the small factor decomposition in another way.

1. There is not one way to solve problems in mathematics.

5×4 is the same as 5 plus 4 times, and $24 \div 4$ is the same as the number of 24 minus 4 by 6 times. $24 \div 5$ is 24 to 5 to 5 to 4 to 4 to the rest.

$A \times B + C = A \times B + C - A + A = A \times (B + 1) + C - A$

$A \times B + C = A \times B + C - B + B = (A - 1) \times B + C + B$

The 1 increase in item B must reduce the value of item A to the rest, and the 1 decrease in item A must increase the value of item B to the rest.

If ABC values are expressable $A \times B + C$ ($A > B$, $A > C$, $C > 0$), A can be reduced by 1 and B can be increased by 1. When A is reduced by 1 and C + B is increased by 1 and C - A is treated by 1. The conditions should be satisfied with $C - A > 0$, $C + B > 0$, $C - A < A$, $C + B < A$.

$C + B + (B + 1) + (B + 2) \ldots. - A - (A - 1) - (A - 2) .. = 0$ back side small factor decomposition was treated, but the value m increased by 1 part in the rest part, the value n decreased by 1 part of A part, $ABC = (A - n)(B + m)$.

The increased m value and the reduced n value are non-regular but not regular.

2. Example1

   ABC = 2183

   A = 60

   B = 36

   C = 23

   2183 = 60 × 36 + 23

   2183 = 59 × 36 + 23 + 36

   2183 = 59 × 37 + 23 + 36 -59

   If you reduce item A by 1 and increase item B by 1, you are lucky to factorization into prime factor.

   If the value of item C is zero, you can find the reduced value of item A at that point and the increased value of item B.

3. Example2

   ABC = 2183

   A = 100

   B = 21

   C = 83

   2183 = 100 × 21 + 83

   2183 = 99 × 21 + (83 + 21)   ------(X)

If you reduce A item first, the remaining item will be larger than 100, so you can increase B item first and decrease the item until the rest of A is smaller than A item when it is negative.

$2183 = 100 \times 22 + (83 - 100)$ ----------------------------------(1)

$2183 = 99 \times 22 + (83 - 100 + 22)$ ------------------------------(2)

$2183 = 98 \times 22 + (83 - 100 + 22 + 22)$ -------------------------(3)

$2183 = 97 \times 22 + (83 - 100 + 22 + 22 + 22)$ --------------------(4)

$2183 = 96 \times 22 + (83 - 100 + 22 + 22 + 22 + 22)$ ---------------(5)

$2183 = 95 \times 22 + (83 - 100 + 22 + 22 + 22 + 22 + 22)$ ----------(6)

After that, you should increase the B item and reduce the remaining value for the remaining items.

$2183 = 95 \times 23 + (83 - 100 + 22 + 22 + 22 + 22 + 22 - 95)$ -----(7)

If the value of A item is large in the value of B item, the change of A item is greater than B item.

4. **Time Complexity**

   The measurement of the time complexity of subtraction and addition is the maximum $O(n)$ time. If the decimal judgment is made in the existing method, it is $O(n^2)$.